

Building Smart with Using BIM Correctly

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Building Information Modelling (BIM) is an important disruptive technology for the design and construction industries. In order to have more collaboration among parties, we need to use BIM with all the tools and approaches. Successful process in design modeling can lead to a very successful BIM coordination in construction.

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YBM'yi Doğru Kullanarak Akıllı Yapım

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Yapı Bilgi Modellemesi (YBM), tasarım ve inşaat endüstrilerini sarsan önemli bir teknolojidir. Paydaşlar arasında daha fazla işbirliği yapabilmek için, YBM'yi tüm araç ve yaklaşımlarla kullanmamız gerekiyor. Tasarım modellemedeki başarılı süreç, inşaatta çok başarılı bir YBM koordinasyonuna yönlendirebilir.

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1. INTRODUCTION

Construction technologies are rapidly changing despite of traditional thought process in design and construction which is still widely common. If we look at why we can't resist these rapid changes in construction, we should look at the way we transformed to build buildings from past to recent. Some of the reasons for these changes are, advanced or complex building systems and components, more stringent building and fire codes, increased comfort level in buildings, variety of new building materials and their applications. All these force the industry to think in a different way.

2. BUILDING SMART WITH USING BIM CORRECTLY

Building Information Modeling (BIM) is a process to develop collaborative thinking and communication with more advanced visualization techniques. This process creates in multiple layers of project coordination for stakeholders. Since BIM is an advanced tool to accelerate project collaboration, it perfectly engages with recent construction techniques and actually forces industry to use BIM to solve problems efficiently.

It is not just more advanced construction techniques which is forcing use of BIM. It is also trending project delivery methods which allows in depth communication and early collaboration among team. IPD, such as Design Assist, Early Preconstruction BIM collaboration or Design Build project delivery methods are some of the samples of these trending processes.

BIM uses are greatly advanced in design and construction in recent years by the technology advancement, such as increased cloud computing, faster processors and more advanced graphic cards etc. One of the benefits of these advancements result more comprehensive construction processes to build smarter. If we look at construction process, it has almost similar to the silos we see in design process. In design, architects and consulting engineers are mostly working in silos which don't communicate efficiently and result with less coordinated design documentation and thought process. This also makes a ripple effect to construction process and all unresolved issues appear on the surface in this phase. What happens is, now we are not just facing with

uncoordinated design issues but also facing to hardly catch up with construction schedule and budget which can be much more complicated and difficult to achieve for CM/contractors and project owners.

If we look at construction silos, from the preconstruction to the construction phase, construction team can be easily isolated if we don't implement BIM processes successfully. Estimating department might not be aware of all the details of purchasing, preconstruction team might not be aware of what was the initial contracts and promises that have been made to owner at the award phase. All these makes the construction process much harder in later days when everything mobilized to field and start building.

One of the most important action to eliminate these silos in design and construction phases is to increase collaboration among stakeholders. If both sides of the team in design and construction listen each other and understand their challenges, process will be much smoother for both. Especially in standard BIM processes in construction, contractors and CMs are still referencing on design team's models at certain levels in BIM coordination. Especially for the trades which are not participating in BIM coordination. Therefore, these referenced design models can be improved if design teams know what the modelling aspects are which can help construction process in design. These modeling practices can be tremendously beneficial for more accurate design documentation, more reliable 3D design models, less RFI and change order processes in construction. If we look at design models and consider what would be the items to achieve this may be listed as follows:

1- Every successful design BIM process starts with a well-established design BIM execution plan, organizing all roles and responsibilities among the design team including but not limited to file sharing protocol and timeline, project coordinates, file naming structure, coordination meetings etc.

2- All architectural models and backgrounds provided for consultants should be up to date in structural, MEP and/or other consultants drawing sets and coordinated, especially for the following list:

- Architectural floor plan backgrounds including reflected ceiling plans;

- All slab openings and shaft edges dimensions;
- Floor finish elevations;
- Floor slab thicknesses, floor depressions and finishes should be coordinated with structural and reflected to their respected 3D models;
- Details containing multiple disciplines' input.

3- Accurate modelling techniques for all the components of the 3D models such as wall thicknesses, types and properties, door types, properties, ceilings, light fixtures and other ceiling elements, floors and their correct thicknesses which are coordinated with structural floors and structural members, all MEP related items and their related access and clearance with accurate modelling techniques. Components needs to be considered:

Walls/Partitions:

- Wall types thickness accuracy (with correct assembly, including correct stud sizes for MEP systems, finish layers, veneers, acoustical layers, head & foot walls, feature walls etc. should be added as a layer or added as separate to the assembly thickness).
- Rated (fire or smoke) walls tagged and labeled in wall type names or in properties.
- Wall devices and access doors on walls - specifically on specialty spaces such as surgical rooms, MRIs, media rooms etc.
- Wall heights for smoke and fire rated walls (up to deck or others +/-6" above the ceiling).
- Knee walls or short walls with MEP connections (including correct structural framing) to ensure assembly is adequate.
- Modular walls, movable partitions, sky folding partitions w/ housing shown on the ceiling/ or on the sides of the wall, consider supporting structure and motor housing etc.
- Fire shutter/doors at elevator lobbies and egress areas.
- Flood walls/ barriers and their housing for space allocation (hydraulic, sliding, tilt etc.).
- Shield walls / specialty insulated walls.

- Glass walls, storefronts and their structure and connection clearances.
- Vestibules with their ceilings and MEP connections (roof drains, conduits, lights, diffusers etc.) – (vestibules are usually left behind since they are fairly smaller spaces, however, it can effect to overall lobby design and building entrance).
- Curtain wall embeds (knife plates, embed etc.), wind bracings- (Design Team may get some preliminary information from their curtain wall consultants, and allocate spaces for curtain wall connections).
- Mechanical room and closet walls or ceilings should be identified and coordinated in architectural 3D model.

Doors:

- Door width and their framing should be modeled accurately in architectural model and clarified clear door width and framing/ opening width in door schedules.
- Door types and hardware types in properties.
- Overhead rolling doors/shutters and clearance for their framing structure, hood and motor space allocation.
- Flood doors and their required clearances.
- Loading dock doors (rolling or folding etc.).
- Large width doors which require specific support (such as patient room doors, mechanical room doors etc.).
- Glass partition doors and their relations to storefront or curtain wall.
- Elevator doors.
- Revolving doors at lobby and vestibules.

Ceilings

- RCP lighting, sprinkler head, MEP diffusers and grills should be consolidated in one design source, preferably in architectural RCPs. If the mechanical engineer has to change the layout due to mechanical calculations, architectural team should be informed for the layout change.

- Architectural RCPs vs MEP RCPs backgrounds. Updated links between disciplines – accuracy of information.
- Ceiling devices (including owner provided, prepurchased, anything in the scope of the project).
- Ceiling thicknesses, insulated panel thicknesses.
- Ceiling Height/MEP/headroom clearance (generic ceiling with no thickness) at “no ceiling” areas, shell spaces/ garages, loading docks.
- Access panel locations at gypsum or any specialty ceilings.
- Above ceiling access (generic box or dashed lines on RCP).
- Soffits and soffit walls- Rated soffits for MEP.
- Cove lighting/ lighting housing etc.
- Valance walls at ceilings.
- Lighting fixtures / specialty lighting and their housing/ clearances, any pending lights needs base/ structure.
- Any ceiling hung equipment (projectors, protector screens, patient lifts, exam lights, booms, working stations with ceiling mount.
- Ceiling outlets (supply and return diffusers, linear diffusers with their plenum sizes from MEP.
- Sprinkler heads (usually architect puts the initial layout and engineer revise it and coordinates and then subs locate with final calculations).
- Specialty ceiling structure.
- Exterior soffits on envelope, ceilings, canopy etc.

Floors:

- Floor assembly thickness including finish floor (Generally, finish floors are used as a guide to maintain coordination spaces).
- Finish layers vs. structural slab should be identified and correctly modeled in architectural and structural 3D models.

- In-slab conduits, plumbing, electrical boxes, vertical penetrations, sleeves, floor drains should be coordinated between all discipline models.
- Shaft opening and floor edges, slab edges, shaft curbs should also be coordinated between disciplines.

MEP and Other Building Components:

- Owner bought or furnished equipment and their connection points.
- Connections for future equipment.
- Misc. supports for floor, wall and ceiling mounted building components such as, equipment, fixtures, devices etc. (if the size of supports are not known, it should be shown as clearance/access zone).
- Equipment platforms, catwalks, gratings, ladders etc. (if the size of supports are not known, it should be shown as clearance/access zone).
- Accurate housing of all equipment, devices or fixtures on ceilings, walls and floors (if the size of supports are not known, it should be shown as clearance/access zone).
- Access/clearances such as equipment, valve, electrical panel, access panels access, valves, equipment replacement and maintenance accesses.
- Rigging and Egress paths on MEP floors, ladders etc.
- Exit lights coordination on architectural RCPs and Electrical drawings.
- Stair standpipe and valves and their required heights (including coordination with stair structure).
- Duplicated MEP items in MEP models results with duplicated counts and misleading on scope (for exp. fire tank being shown in fire protection and plumbing at the same time produce confusion or elevator machine rooms panels shown in elevator consultants models and electrical models at the same time).

4- RCP and wall elevation coordination which shows all the ceiling and wall devices which are coordinated with structural and MEP models and coordinating the information among the documents to provide consistent information. Architectural Reflected Ceiling Plans (RCPs) are a very important design information for preconstruction and construction coordination. RCPs should show all the MEP and architectural devices (including owner provided) and ensure all these systems are coordinated in the architectural plans. If Design Team doesn't have this information from the owner, or consultant hasn't been hired at that time, the information should be included at later phases and issued as a revision.

These are just some of the items design teams should consider to have smooth transition to construction process with their documentation.